REMARKS

Claims 1-8 remain in this application and are currently amended. No new matter has been introduced.

Objection to Oath/Declaration

Applicants inadvertently did not submit a newly executed oath on January 25, 2007, in the Supplemental Response to the Office Action mailed August 10, 2006. Applicants are currently having a new Oath/Declaration executed, and they will send it in as soon as it is finished.

Rejection under 35 U.S.C. § 102(b)

Claims 1, 3, and 5-8 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Chow (U.S. Pat. No. 5,240,749). Applicants respectfully disagree.

As a preliminary matter, claim 1 has been amended to clarify that the pulsed discharge is a repeated succession of a low-power state and a high-power state; *i.e.*, the pulsed discharge cannot be only a succession of one low-power state and one high-power state. This amendment is supported by the specification as filled; particularly by paragraphs [0046]-[0048], [0054], and [0059]. Applicants also note that the power generated by the microwave generator is periodic with time; however, the signal is not necessarily strictly periodic.

First, the Patent Office asserts that the American Heritage Dictionary (4th Edition, Houghton Mifflin Company, 2000) defines a pulse as "a brief sudden change in a normally constant quantity". The Office, however, disregards the full meaning of "pulse", which is clearly defined as a brief and sudden change or a series of intermittent occurrences:

3. *Physics*

a. A brief sudden change in a normally constant quantity: *a pulse of current; a pulse of radiation.*

b. Any of a series of intermittent occurrences characterized by a brief sudden change in a quantity. (Emphasis added)

Further, Dictionary.com (*Dictionary.com Unabridged (v 1.1)*; Random House, Inc.; http://dictionary.reference.com/browse/pulse, accessed on April 3, 2007) defines a pulse as:

6. *Physics.* a single, abrupt emission of particles or radiation.

12. *Physics.* to emit particles or radiation periodically in short bursts. (Emphasis added)

Furthermore, The Compact Oxford English Dictionary (2nd Edition, Oxford University Press, 1987) defines a pulse as:

4.a. The rhythmical recurrence of strokes, vibrations, or undulations; beating, vibration.

4.b. each of a rhythmical successions of strokes or undulations.

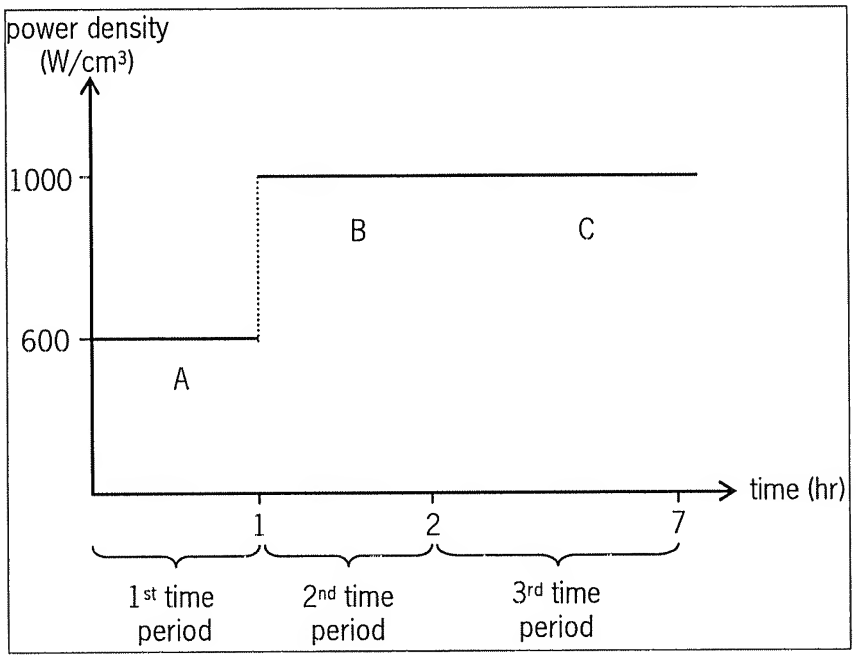
2.a. To beat, throb ,as the heart, etc.

3.a. To perform or exhibit a rhythmic movement; to beat, vibrate, undulate.

As amended, claim 1 discloses that the gas is subjected to periodic pulsed discharges. In light of the above definitions, the concept of "periodic pulsed discharges" should be considered to be: 1) a *brief and abrupt change* of power density applied to the gas, and 2) the *series of occurrences* of said pulses are *repetitive and periodic*. On the other hand, the application of two successive power states for a long period of time, such as several seconds or more, is not considered a pulse discharge. These power states should be considered *plateaus*.

Chow does not disclose a pulsed discharge of power, as currently claimed. Chow clearly applies *two* successive, constant power densities: the first occurs in the 1st step and has duration of one hour; and the second, which has the higher power level than the first, occurs in

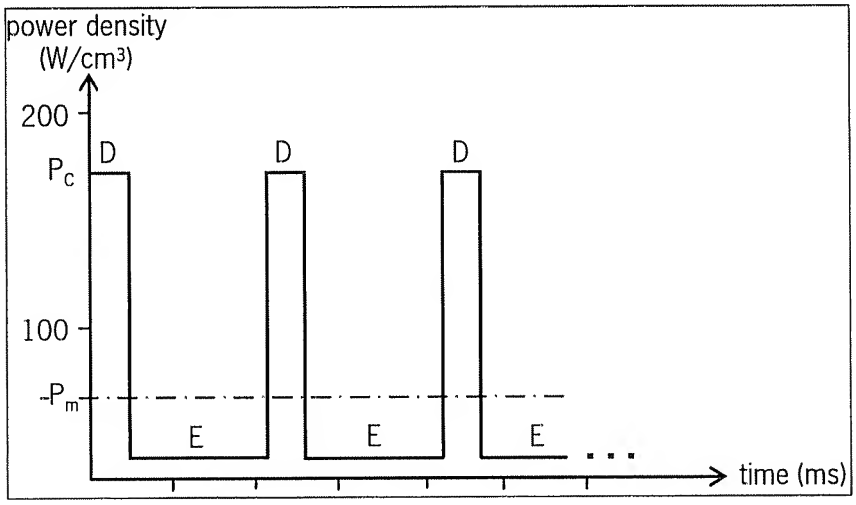
the 2nd and 3rd step (duration of one hour in the 2nd, and duration of five to six hours in the 3rd step). Please see Chow Figure bellow:



Chow Figure: technical effect A forms diamond-like ball; technical effect B forms diamond faces on top of the diamond-like ball; and technical effect C causes the faces on top of the particles to be joined together into a semi-continuous diamond.

Chow discloses that the transition between the two power densities is done by only *one* "increase" (claim 1, lines 17-23). Chow does not disclose that this "increase" is *brief*, *sudden*, or *abrupt*, nor that is *periodical in short burst*. Chow does not disclose or suggest that these two power densities are repeated. That is, they cannot be considered to be periodic, since they don't recur at intervals of time. Thus, according to the above definitions, Chow's "increase", which is neither brief nor abrupt, cannot qualify as a "pulsed discharge," as required by the claims.

In contrast to Chow, the current invention comprises the additional feature of applying *periodic pulsed* discharges, forming a *repeated* succession of a low-power state and a high-power state. Please see Invention Figure bellow:



Invention Figure: technical effect of *D* increases the characteristics of the plasma (high concentration of atoms H and C-containing radicals), thus high deposition rate; and technical effect of *E* decreases the mean power of discharge, thus the wall temperature remain low and less H-atoms recombine.

Applicants note that Chow's method has the same deficiencies as the prior art described on page 1, lines 8-17 of this application, and as such does not anticipate the currently pending claims, which are directed towards curing these deficiencies.

In view of the foregoing, the Chow reference does not disclose the currently claimed invention. Thus, the applicants respectfully request reconsideration and withdrawal of the § 102(b) rejections of claims 1, 3, and 5-8.

Rejection under 35 U.S.C. § 103(a)

Claims 2, 4, and 7-8 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Chow (U.S. Pat. No. 5,240,749) in view of Kawarada *et al.* Applicants respectfully traverse this rejection.

As discussed above, Chow discloses a method wherein the power densities are applied increasingly in a stair-like manner on hour time scale. Chow does not disclose or suggest the use of the periodic pulsed discharges in the manufacturing of a diamond film. The use of the *periodic* pulsed discharge aims at improving the growth rate of the diamond films manufacturing. Indeed, due to the repeated succession of the low-power states and high-power states, the walls of the chambers do not heat up. This prevents H-atoms from recombining, thus their concentration remains higher in the plasma. Consequently, as H-atoms constitute activators of the reaction, the diamond film may be deposited at a higher rate for a constant power consumed.

Nothing in Chow suggests the existence of the technical problem caused by warming of the apparatus walls. Chow does not indicate how to solve this problem; in fact, Chow does not even mention it. One must conclude that either Chow does not solve this problem or Chow's method involves a means to cool the walls (please see the specification: Background of the Invention). Indeed, if Chow does not cool the walls of the chamber, the recombination of H-atoms increases. Under these conditions, a diamond film that has good surface characteristics is obtained, but with a low rate of manufacturing. The present invention, however, aims exactly at that: the improvement of the low rates of manufacturing.

Kawarada *et al.*, which discloses the range of the plasma temperature and density, does not cure the deficiencies of the Chow reference. Combining Chow and Kawarada would afford a

method that does not use the pulsed discharges of the current claims, so the combined references do not make the currently claimed invention obvious.

Further, in order to obtain the method of the present invention, the person of ordinary skill in the art, having the Chow and Kawarada *et al.* references at hand, would need to, at a minimum:

1. substantially decrease the duration of each plateau, from about 1h to a few ms;

2. repeat, for a time to determine, the application of a low-power state and a high-power state, in order to obtain a periodic signal, forming a repeated succession of a low-power state and a high-power state; and

3. determine, according to the conditions of the invention and the desired growth rate, the respective power densities of the low-power state and the high-power state, as well as the ratio of their duration.

All of these would have to be done even though there is no teaching, suggestion, motivation, or reason for the person of ordinary skill in the art to do so. Further, to do so would require the person of ordinary skill in the art to perform a great number of experiments, calculations and simulations on the plasma modelling to modify the method disclosed by Chow in order to obtain the claimed method. Without a reason to do so, Applicants fail to see how the person of ordinary skill in the art would come up with the currently claimed invention. This implies that the differences between the claimed method and Chow in light of Kawarada *et al.* are not obvious.

In view of the above arguments, Chow in view Kawarada *et al.* does not render the currently claimed invention obvious. Therefore, the applicants respectfully request reconsideration and withdrawal of the § 103(a) rejection of claims 2, 4, and 7-8.

CONCLUSION

Applicants respectfully contend that all requirements of patentability have been met. Allowance of the claims and passage of the case to issue are therefore respectfully solicited.

The Examiner is urged to contact the Applicants' undersigned representative at (312) 913-2114 if the Examiner believes a discussion would expedite prosecution of this application.

Respectfully submitted,

Date: April 3, 2007

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